

CLAIMS

What is claimed is:

1. An air purification system comprising:
a substrate; and
a coating applied on said substrate; and
an energy source to desorb water vapor that adsorbs on said coating.
2. The air purification system as recited in claim 1 wherein said energy is microwaves.
3. The air purification system as recited in claim 1 wherein said energy is radiowaves.
4. The air purification system as recited in claim 1 wherein said coating is a photocatalytic coating.
5. The air purification system as recited in claim 4 wherein said photocatalytic coating is titanium dioxide.
6. The air purification system as recited in claim 4 wherein said photocatalytic coating is one of Fe_2O_3 , ZnO , V_2O_5 , SnO_2 , and FeTiO_3 .
7. The air purification system as recited in claim 4 wherein said photocatalytic coating includes a metal oxide loaded on a photocatalytic material.
8. The air purification system as recited in claim 7 wherein said metal oxide is one of WO_3 , ZnO , CdS , SrTiO_3 , Fe_2O_3 , V_2O_5 , SnO_2 , FeTiO_3 , PbO , Co_3O_4 , NiO , CeO_2 , CuO , SiO_2 , Al_2O_3 , Mn_xO_2 , Cr_2O_3 , and ZrO_2 .

9. The air purification system as recited in claim 4 further including a light source to activate said photocatalytic coating, and said photocatalytic coating oxidizes contaminants that are adsorbed onto said photocatalytic coating when activated by said light source.
10. The air purification system as recited in claim 9 further including a surrounding enclosure defined by porous screens defining an energy cavity, said substrate, and said photocatalytic coating, and said light source are located in said energy cavity.
11. The air purification system as recited in claim 9 further including a surrounding enclosure defined by porous screens and defining an energy cavity, and said substrate and said photocatalytic coating are located within said surrounding enclosure and said light source is located outside of said surrounding enclosure.
12. The air purification system as recited in claim 9 wherein said light source is an ultraviolet light source.
13. The air purification system as recited in claim 9 wherein said light source is an ozone generating lamp.
14. The air purification system as recited in claim 9 wherein photons from said light source are absorbed by said photocatalytic coating to form a reactive hydroxyl radical that oxidizes contaminants in the presence of oxygen and water to water and carbon dioxide.

15. The air purification system as recited in claim 9 wherein said contaminants are one of a volatile organic compound and a semi-volatile organic compound including at least one of formaldehyde, toluene, propanal, butene, acetaldehyde, aldehyde, ketone, alcohol, aromatic, alkene, and alkane.
16. The air purification system as recited in claim 9 wherein light from said light source does not couple with said desired wavelength of energy.
17. The air purification system as recited in claim 1 wherein said substrate is an array of voids separated by a solid.
18. The air purification system as recited in claim 1 wherein said air purification system operates at room temperature.
19. The air purification system as recited in claim 1 wherein said desired wavelength of energy is absorbed by said water and not absorbed by said coating and said substrate.
20. The air purification system as recited in claim 1 wherein said desired wavelength is selected to desorb said water to maximize heating of said water.
21. The air purification system as cited in claim 1 wherein said desired frequency is 17 GHz at 20°C.
22. The air purification system as cited in claim 1 wherein said desired frequency is 38 GHz at 50°C.
23. The air purification system as recited in claim 1 wherein said energy source generates a desired wavelength of energy to desorb water vapor that adsorbs on said coating.

24. An air purification system comprising:
a substrate; and
an energy source to generate a desired wavelength of energy to desorb water vapor that adsorbs on said substrate.
25. The air purification system as recited in claim 24 wherein said energy is microwaves.
26. The air purification system as recited in claim 24 wherein said substrate is photocatalytic.
27. The air purification system as recited in claim 26 wherein said substrate is titanium dioxide.

28. An air purification system comprising:
- a substrate; and
 - a photocatalytic coating applied on said substrate;
 - an ozone generating lamp to activate said photocatalytic coating; and
 - an energy source to generate a desired wavelength of energy to desorb water that adsorbs on said photocatalytic coating.

29. A method of desorbing water comprising the steps of:
- selecting a desired wavelength of energy;
 - emitting said desired wavelength of energy;
 - absorbing said desired wavelength of energy by said water; and
 - desorbing said water from a photocatalytic coating including a metal oxide loaded on a photocatalytic material.